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ABSTRACT

At present not-for-profit information accessing services play a unique role in the information transfer process as they provide long term discipline-oriented access to the subject content of individual primary published documents regardless of country of origin, language, or subject emphasis. While not all of these services are U.S. based or in the English language, neither factor should disqualify them as a fundamental resource for a U.S. national program; they can and should continue to serve in their present capacity in any operation of a national program. Implementation of a national program, to be effective, will have to deal successfully with the widely divergent pressures of the federal agencies, and support will need to be provided for the non-federal services to assure continuity of systematic development of all basic information resources. (RAA)

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RELATED PAPER
TWENTY-FIVE

THE ROLE OF NOT-FOR-PROFIT DISCIPLINE-ORIENTED INFORMATION-ACCESSING SERVICES IN THE NATIONAL PROGRAM OF LIBRARY AND INFORMATION SERVICES

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Describes the unique role of the not-for-profit discipline-oriented information-accessing services in providing long-term discipline oriented access to the subject content of individual primary published documents regardless of country, origin, language of publication, or subject emphasis of the individual documents. Implementation of a national program to be effective would have to deal successfully with the widely divergent pressures of the Federal agencies. Support would need to be provided for the non-Federal services to assure continuity of systematic developments of all basic information resources.

DECEMBER 1975

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The United States, today, faces an impending national crisis arising from its inability to effectively utilize publically available information. Current tools for locating pertinent data within the world-wide information store are neither sufficiently powerful nor adequately responsive to avoid costly repetition of research or to permit rapid assembly of the information that decision-makers need as a reliable basis for choice among developmental alternatives. Adequate information access requires responsive, highly individualized systems which utilize modern data handling equipment and techniques. Such systems are techniques. Such systems are technically feasible, but in the absence of sustained national support, their development continues to be slow and uncoordinated. This situation is particularly apparent to the non-profit discipline-oriented information-accessing services which constitute one of the essential elements within the information supply community. This essay identifies several of the current roles and concerns of these services and their possible relationship to a National Program. We feel that such a program could benefit information users by providing a more formalized network for cooperation among information community members and by promoting, on a national level, the coordinated development of the entire information supply system within the U.S.

THE DISCIPLINE-ORIENTED SERVICES

The existing information-supply system is a diverse community of separately maintained, yet heavily interdependent, components. Some community members are government based; others are privately operated. Some are designed to make a profit; others are non-profit. The community is international, both in membership and activities.

Useful information is widely dispersed in the publications of many nations. Most of the primary literature -- the basic means for first communicating the findings of pure and applied research and, collectively, the core of the publicly available, permanent archive of knowledge -- comes from outside the U.S. For example, only about one-quarter of the documents cited by CHEMICAL ABSTRACTS (CA), which strives for complete coverage of the world's published chemical information, originates within the U.S. Thus, our national information supply, and consequently our national welfare, depends heavily on information generated outside the U.S. We also share with other nations the use of the world's major information-accessing tools, whether these tools originate within the U.S. or abroad. The international aspect of information generation and use must not be ignored as national information plans are developed.

Learned societies around the world have traditionally created most of the scholarly journals, which form the bulk of the primary literature. These societies have also traditionally produced the discipline-oriented information-accessing services -- often called abstracting and indexing services or secondary information services -- that provide subject-based access to the content of the primary literature. Outside the U.S., many of these societies receive direct financial support from government and industry to assist in accomplishing their information gathering and publishing functions. In the U.S., such support is rare. Production of most U.S. secondary services depends entirely upon revenue from the sale of the output of these services. Further, much of the intellectual effort needed to create these services has in the past been contributed without charge by members of the sponsoring learned society; these are usually also the individuals who utilize these services. Such contributed effort now plays a much smaller role in producing discipline services than was the case a decade ago. Despite this reduction in volunteer effort, the community which is served continues to provide the stewardship of the non-profit services.

A discipline-based, information-accessing service acts as a bridge between primary document and user. These services are designed to help the user locate documents which include potentially valuable information within the full range of published primary documents. (A document is defined as a book, a journal paper, or a report available to the public). Access is based upon user acquaintance with discipline jargon and the logical structure of discipline subject matter. Search files (indexes, etc.) employ a discipline-oriented vocabulary and a subject-oriented file structure. These files are built by staff having subject and language expertise corresponding to the informational content of primary documents being analyzed, and the subject vocabulary is often fully controlled.

A discipline-oriented service provides unbiased subject coverage for the information content of its particular disciplinary field regardless of the primary emphasis of the source publications. A primary document, although it appears in a publication generally oriented toward a given discipline, usually includes a wide range of information associated with other disciplines -- for example, papers in medical journals frequently record details of analysis based directly on chemical and physical properties. So it also follows that any given document is frequently indexed by more than one discipline service -- each service oriented toward a different subject discipline.

Throughout the world, published information is being used more intensively and extensively today than ever before, but unfortunately many of the primary journals and secondary services produced in the United States by the non-profit organizations are in serious danger of financial collapse. Their financial problems have come from technological progress -- vastly improved tools for copying, storing, and retrieving information -- and increases in competitive in competitive and social pressures which have shifted the burden of information supply

from the individual to his employer. Thus, one purchased subscription to a journal or to an abstracting service now serves the needs of many users and the number of subscribers to these services has declined greatly. As a consequence, support for information-accessing services has now concentrated in a relatively small number of subscribers -- seldom more than a few thousand for any given service. Many of these are the private and public organizations, spread throughout the world, which employ users of the service. These discipline services provide international coverage of the primary literature and the use of the services often reflects this coverage. In chemistry, for instance, some 64% of CA subscriptions are delivered outside the U.S. The discrepancy between non-U.S. coverage (about 75%) and non-U.S. sales for CA reflects the existence and use of chemically-oriented information services in other languages and variations in copyright law from one country to another. For example, some copyright laws permit unrestricted copying of scientific material for scientific use.

INFORMATION SUPPLY COMMUNITY -- INTERFACES

The decentralized generation and use of information and the huge number of documents published in many languages with widely varying subject emphases imply deep interdependencies among primary publishers, producers of information-accessing services, libraries, information centers, and information users. The effectiveness of information dissemination depends upon prompt, uninterrupted user access to the subject content of the primary literature. The great breadth and huge volume of this literature and the long useful life of much of the reported information combine to make continuity of access difficult. It is not useful, for example, to know of a document which includes needed information and not be able to obtain a copy of that document. Nor is it useful to have an organized collection of primary documents which includes needed information but to have no way to identify the specific document(s) which include that information. Obviously, efficient access to the content of the primary literature cannot occur without coordination of operational practices among primary publishers, secondary services, libraries, and information centers.

New information is established in the public domain through subject-oriented primary publications: journals, technical reports, symposia proceedings, patents, trade publications, reviews, etc. Each such publication may be directed toward a regional, national, or international audience. The primary publications which are of interest to a given audience are continually changing. For example, approximately 600 "new" journals that include chemical information appear each year. Some are derived by changing titles, some by splitting existing journals to reflect shifts in the scope of coverage, but many are distinctly new.

Libraries acquire and organize collections of publications and make these publications available to users. However, although the organization of the library collection is usually subject-oriented, it is publication-oriented not document-oriented. "Publication-oriented" implies that the full contents of a journal are covered by a single set of library cards which do not change unless there is a distinct external change in the journal as, for example, a change in the journal's title. In contrast, "document-oriented" implies access to the individual papers in that journal or to the information within each paper. In major research libraries, about 75% of the total collection consists of periodical literature. Thus, the primary journal must be considered the principal element for such library collections, although books, patents, dissertations, and reports are also provided.

But while libraries are oriented toward prepackaged information, e.g., the journal, information consumer's needs are usually focused on narrowly-defined topics, single documents, and isolated facts, and so often cut across many library-oriented packages. Library catalogs do not and are not expected to provide the detailed level of access to library holdings that users often require. These needs are being met only by information-accessing services.

Therefore, libraries depend mainly on outside sources to provide analysis of the contents of the materials they acquire. In the natural sciences, for example, libraries depend almost entirely on abstracting and indexing services for bibliographic control and content access to the published primary literature. This system of operation makes available to the information consumer and to each individual library the subject and language expertise necessary to assure reliable, consistent identification of the informational content of documents across a range of publications far greater than the holdings of any single library.

Information centers provide access to selected data or to extensive collections of documents which include data associated with specialized topics. These centers, which gather, concentrate, and organize detailed information and data, are often staffed by technically trained subject specialists who can interpret, and in some cases evaluate, the stored data. Most such centers in the U.S. are partially or fully supported by Federal Agencies. They depend heavily on discipline information services in seeking out the additions to their resource files, although this interdependence is presently far from a coordinated linkage.

To adequately fulfill their function, information-accessing services must maintain functionally reliable interfaces with all members of the information-supply community by: (a) vigorously seeking to locate new primary publications that include corresponding subject content; (b) identifying and extracting the index-worthy subject matter, wherever possible preserving the primary author's emphasis and jargon to simplify user correlation of the document; (c) bridging from highly specialized

jargon of narrow subject fields to more general terminology, so that non-specialists may gain access to the information; (d) organizing, packaging, and distributing the information in such a way as to simplify its use; and (e) helping the user of the service to locate the primary documents which are referenced by providing reliable bibliographic identification of each document and, where necessary, information to assist the user in locating a source for these documents.

Coordination among the various members of the information community would likely benefit from a National Program. Such nationwide planning would provide a more formal network in which cooperative efforts could be discussed, implemented, tested, and/or expanded.

Many cooperative arrangements currently exist between members of the information supply community. For example, primary and secondary publishers cooperate in many ways to speed the coverage of the primary material by the secondary service. Some journal publishers provide corrected page proofs of their journals to abstracting services as soon as these proofs are available. This practice permits the abstract to appear in the accessing service at the same time as the publication of the source journal or even slightly before publication of the journal. Document title announcement services also illustrate such primary/secondary coordination. In addition, some secondary services also reference material which is placed on deposit by the publisher at the time the primary report is accepted for publication in a journal and the material is available to the public. With the advent of a National Program, cooperative arrangements on a wider scale could be expected, and this would likely speed the transmission of information from its primary source to user.

INFORMATION NEEDS

Meeting the challenge of current problems requires vast improvement within the U.S. in the utilization of accumulated information arising from public and private research and development; from industrial, business, and commercial enterprise; and from educational and governmental activities. This improvement is essential if the U.S. is to solve its growing stream of social problems without continual crises and if U.S. technology is to maintain the U.S. standard of living and to retain the international markets for U.S. products.

The information crisis facing the U.S. is not related just to the size of the accumulated record but is also a consequence of today's major national or international problems, which are dominated by social concerns: population control, urban planning, transportation revitalization, energy conservation, natural resource management, food shortages, etc. Such problems are interrelated and their solutions interdependent.

Timely solutions to today's problems are hampered by our inability to gather the necessary information quickly. Even when the needed data already exists in the traditional accessing tools, it often cannot be located in time to be used in evaluating or solving the problems.

We must also consider the role of information supply in the creative processes. Though there has been little quantification and there are few documented examples of the value of responsive information services in enhancing or stimulating creativity, it is obvious that when information is unaccessible, this prevents--or at best, delays--the creative process. It is equally obvious that information delivered after the need has disappeared not only loses the possible enhancement of utilization but reduces the value of the original work.

The rate of publication has grown so large, however, that neither the current nor the accumulated record can be managed and utilized effectively with traditional printed tools alone. This record in chemistry alone comes from more than 125 countries and appears in more than 50 different languages. It is too complex in detail to permit reliable, timely access to the existing store of information consistent with many of today's needs. This problem can be illustrated by considering the output of the Chemical Abstracts Service of the American Chemical Society. This abstracting and indexing service published about 26,300 pages of abstracts and 27,800 pages of indexes in 1974 -- corresponding to more than 3,000,000 pages of original documents. This is, of course, only the annual increment for one discipline. But the problem is not confined to one or a few fields of learning, to specific types of business or industry, or to selected branches of government. It is general, touching every individual and organization in the U.S. and abroad.

Through the years, the increased complexity of today's problems has changed the approach to solving research and development problems. Historically, investigators were performed by individuals. But as the record of accomplishment grows, as it becomes more applicable to practical use, and as projects become more complex and require more facilities and effort, the individual becomes less self-sufficient. The team approach to investigation can be seen in the fact that primary papers now average slightly more than two authors each. Even in educational institutions, research has become a highly structured activity, often involving an organized team of graduate students and postdoctoral fellows working with a full-time member of the instructional staff.

National interests have created governmental financial support for a very broad range of activity from fundamental research to fully operational technology. The considerable national emphasis on improved technology is reflected in the published record, however, there is no national emphasis on the application of automated technology to the information supply system. In this area, a National Program could be of particular value in acquiring continuity of federal support for private as well as public development of needed information tools.

For without such programs, the overall information supply system will continue to deteriorate and consequently much of the US investment in research and development will be lost. When the information system fails, we will be unable to harvest the crop of applications toward which the national research and development investment is directed.

The alternatives offered by developing computer technology are so numerous and are expanding so rapidly that there will continue to be rapid change in information systems over the next several years, and these systems will have to continue to adapt to new hardware and software capabilities. The development of the necessary information-handling system is neither a short-term nor a one-time effort. Success demands steady, long-term build-up in information handling capability and the associated continuing regular investment in improvement of such systems.

Support for systematic development of discipline information services has traditionally come from Federal Agencies -- primarily the National Science Foundation, through its legislated responsibility for scientific and technical information. This support is necessary to maintain balance with the information-supply mechanisms developed, implemented, and operated by the Federal mission-based Agencies and those organized to make a profit. Recently, however, NSF discontinued such support at the instruction of the Executive Office of Management and Budget (OMB). This arbitrary OMB embargo leaves discipline services without the development resources to keep pace with the accessing services provided by mission Agencies. The break in continuity of Federal support for systematic development for discipline services has had adverse effects on the use of the discipline services. The loss of income already being felt by the discipline services is resulting in tremendous pressure to change their coverage policies. In the absence of well-conceived modernization, these pressures can be met only by reduced coverage which, in turn, can only lead to permanent deleterious effects on long-term continuity of information access for the community as a whole.

NEED FOR COORDINATION

Discipline-based information services play essential roles in the overall information-supply system -- roles that cannot be filled by either mission-oriented information services or by for profit services. Discipline-oriented secondary services access information in a way that is consistent with traditional academic organizations, i.e., colleges and universities. Yet as the discipline method of organization does not prevent interdisciplinary academic programs and research efforts which cross many of the arbitrary dividing lines between disciplines, the discipline-orientation of secondary services does not mean that these services are only valuable to users working strictly within a particular discipline's boundaries.

In reality, discipline-oriented services are employed both within the overall confines of a discipline and by interdisciplinary users and by "missions," which are goals-directed programs, often defined by national governments. And just as the information which is useful to the practitioners within any given discipline comes from the full range of science, so information for any one mission is drawn from a great many sources. In this light it is not surprising that the range of literature useful to any researcher reaches far into many other disciplines, and conversely, that many non-specialists require access to specialized information.

National missions frequently overlap from one country to another because these missions arise out of extra-national causes. However, national missions which outwardly appear to be the same in each of several different countries are separated by different boundaries because of variations in governmental structures from one country to another, and mission information services also differ from one country to another.

The same type of differences exist in the missions of business and industry. However, although some companies maintain extensive libraries and internal information services, these internal information activities depend heavily upon the discipline-oriented accessing services for locating information needed to solve day-to-day operational problems and to plan and support research and developmental efforts. Most companies cannot afford to generate and maintain individualized accessing tools starting from the primary literature. Instead, each company meets its requirements by use of varying combinations of publicly-available discipline-wide services.

For these reasons discipline-oriented secondary services play a vital role in maintaining consistency and continuity in information access both across time and internationally. This remains true even with current emphasis on missions. Because of the importance of continuity of information in any problem-solving endeavor, the resources created and maintained by the disciplines are the principal resources from which newly defined public concerns must draw. Without discipline-based services, the detailed historical record would not be available to guide the search for solutions to current, pressing problems. However, US programs are not currently focused on feeding the missions from a logical flow of information from the disciplines.

The missions of the federal agencies, and therefore, the information they deal with, frequently overlap. These overlaps are becoming increasingly common as new agencies are established to meet new "people problems." These mission-oriented information tools specially developed by these agencies are often based largely on published information which is already being covered by the combined contents of the long-existing discipline-oriented information services -- most of which are operated outside of the government.

Despite this overlap, in the past there has been no good alternative to duplicated effort because the technology did not exist which would permit ready use of combinations of the discipline data bases to support agency information needs adequately. Today, however, the situation is different. Technology is now available to permit agencies to effectively utilize combinations of the discipline data bases to provide necessary information support of agency missions. This approach would require investments by the Federal Government to assist the discipline services to standardize their processing operations to simplify such use of combinations of discipline data bases. Hopefully, a National Program would aid in obtaining the federal investment necessary to support these standardization efforts. The Federal investment in system development would be small by comparison to the public benefit derived from reducing duplication of processing expense by separate production of the overlapping mission and discipline services.

Similar coordination between the not-for-profit discipline-based services and the various profit-making information accessing organizations would be very helpful. For-profit, specialized services often direct attention toward limited segments of the "nonprofit's" coverage. The specialized services, by concentrating on highly-saleable segments of the nonprofit market, can often offer advantages in price and speed of coverage which attract an audience drawn from those served by broad-range discipline-based services. This obviously reduces use of non-profit, discipline-oriented, information-accessing services and reduces their viability.

At any given time, the individual segments of discipline coverage are seldom equivalent in terms of the amount of community use. Moreover, future thrusts in research and development and the time spans of such thrusts cannot be reliably predicted. Thus, if a discipline information service were to continually eliminate subject matter which entrepreneurs have selected for coverage in a profit-making service or which are covered in newly established Federal mission services, there would be no assured continuity in discipline coverage by the discipline service over time. This loss in continuity would greatly reduce the backup value of discipline services in support of current and future missions and for-profit information services by breaking the link to closely related information not covered in the latter services and by leaving no consistent accessible record should the latter services change coverage or cease to operate. Careful study of a number of instances has shown that once continuity of coverage has been broken, it can seldom be re-established. But more important, the loss of continuity of access provides little possibility for dealing promptly with new critical demands for information because there is no longer a coherent accessing record.

When an information service operated by a scientific society is discontinued, the continuity of the information archive in the corresponding field is destroyed, and the community has lost the sustained, contributed effort and expertise supplied by the society's stewardship; these contributions cannot be replaced without greatly increased expense to the public.

The Federal Government has shown a general reluctance to fund development of non-profit organizations with which profit-making tax-paying organizations compete. This encourages profit-making organizations to initiate information services which partially overlap coverage by long-established non-profit discipline services. The Federal bias toward for-profit organizations disregards public and private investments in the discipline services and has the likely consequence of reducing Federal support for development of the discipline services. This bias encourages intrusion by entrepreneurs into the segments of discipline coverage that have the highest saleability, leaving the less saleable material solely to the discipline services. Such intrusion seldom benefit the general public. Instead the result is more usually wasted public resources and much less service to the public over the long term.

The criterion of "noncompetition" with tax-paying (or with non-tax-paying) organizations is not similarly applied to information services operated by mission-oriented Federal Agencies even though non-profit discipline services are subject to this guideline.

No National Program can be successful unless it has the means for dealing with such imbalances.

CONCLUSION

At present, the non-profit, discipline-oriented information-accessing services provide long-term discipline-oriented access to the subject content of individual primary published documents. This is a unique role in the information-transfer process. It provides the only continuity of access to discipline information for all of the cumulating primary literature regardless of country of origin, language of publication, or subject emphasis of the individual documents. Not all of the discipline services are based in the US and not all services are published in the English language -- neither of these factors should be a qualification for a fundamental resource in a US National Program. The discipline services intend to continue to serve in their present capacity in any operation of a National Program. However, the value of the discipline services is heavily dependent on the stewardship provided to them by those who are trained in the corresponding disciplines -- this must be preserved.

Discipline information services would favor implementation of a National Program provided that the program would within a predictable period, become able to deal effectively with the widely divergent pressures of the Federal Agencies. The program would have to provide for support for the non-Federal services equivalent to that provided to Federal services and for continuity of support for systematic development of all basic information resources. Administrative continuity and balance would be essential.